On the Mechanisms Driving Pain and Other Common Sensations Associated with the Sense of Touch

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Introduction

The act of gently squeezing a nerve fiber from the sides should evoke the feeling of warmth in the skin. This happens due to the "wringing out" of chemicals that aid conduction and an associated increase in their concentration around edges of nerves. The greater conductivity of electricity around the edges relative to the core of the fiber is the cause of the feeling of warmth.

Abstract

The feeling of cold, conversely, is triggered by greater conductivity in the core of nerve fibers relative to the edges of those fibers. Thus, I believe the brain is able to distinguish nerve signals conducted along the core of nerve fibers from signals conducted along their edges and map the contrast between those sensory inputs.

Next, I propose that the sensation of tingling is caused when damage is done to the sheath of nerve fibers but not to the core, which can occur when nerves are stretched or pulled upon. This may explain how hyperglycemia causes tingling prior to permanent damage.

I furthermore speculate that the sensation of wetness is based upon the relatively poor conduction of localized clusters of nerves. A dry hand can sense wetness, but a person immersed in water does not feel wet since all areas of their skin are equally covered in water, which diverts electricity away from nerve fibers.

Next, I propose that the sensation of burning lingers because of the sponge-like quality of the nerve fibers. This same sponginess makes it so that concentrations of conductive chemicals can vary due to physical pressures exerted. Burn-type nerve damage maximizes the immune response since ruptured cell membranes of the epidermis give off chemical signals that prompt a general inflammatory response that impacts the nerves, even in deeper skin layers. These immune/inflammatory responses trigger the errant flow of oxygenated blood into nerve fibers. Nerve fibers, although they require ATP (a byproduct of synthesis of oxygen and glucose) to remain living, do not have their own mitochondria and do not respond favorably to direct exposure to oxygen. Oxygen from the blood rather than oxygen from the air, as is commonly believed, is the source of burn-type pain, which could be characterized as the sensation of warmth, tingling, and wetness all conveyed at the same time. Damage to the edges of fibers coupled with an inflammatory response result in oxygen-rich hemoglobin infiltrating fibers.

Most importantly, I have now come to believe that nerve sensations, contrary to the current prevailing theory, are made possible by a constant generation of electricity that flows from the brain stem "downstream" to the finer nerve endings at a constant level of voltage which acts like a series of constant pings. Nerves, when functioning nominally, send a standard feedback "upstream" and any deviation from that standard feedback is interpreted as a touch or pain sensation by the brain. Since the conduction of electricity takes a predictable amount of time to travel through nerves, the nerve responses behave, in a way, like echolocation. A failure of a nerve bundle the brain associates with a particular standard latency to respond with full intensity tells the brain that skin may be wet, for instance. Both the intensity and relative alacrity of feedback within the system provide useful information to the brain. In fact, this is the only plausible explanation for how it is that the brain can deduce where, exactly, on the body a sensation is coming from, since nerves in different parts of the body, much like the dendrites of the brain, are essentially duplicates of the same repeating branching pattern and they are unable to uniquely identify themselves and their position to the brain of their own accord.

Thus, the human sense of touch has many parallels to the information technology principle of packet analysis. Measuring response times alone can narrow the possible source of a transmission to a relatively small group, but it, alone, is not enough to narrow the search to a single Internet user. However, by measuring the dynamics of every node in a complex system relative to one another by creating up-to-date maps of ping times along all possible sub-routes, a specific user could be identified. It is in this same way that the brain can tell the difference between signals coming from two different nerve endings even if those endings have identical associated response times.

Since these nerve endings are not in and of themselves capable of performing computations, they cannot calculate their distance from the brain. Only the brain can and the brain must do this by controlling the timing out the outgoing "baseline pulses." This subject loosely relates to my earlier work on the role of ectopic brain tissue deposited in the spinal column being the likely culprit in migraines. In the case of migraines, such a powerful signal being transmitted along conduction lines sensitive enough to interpret passive feedback from all of the nerves of the body is interpreted as extremely severe pain. Not only do the errant signals associated with migraines cause the sensation of pain, but it is known that permanent damage to the brain can result from this type of overload, which has some commonalities with seizure activity in that regard.

This explanation of the sense of touch would also go a long way toward explaining the phenomenon of phantom pain experienced by amputees. Consider the case of the patient with a leg blown off by a landmine that continues to feel pain years after the injury scabs over. I propose that the over-pressure wave associated with the explosive in the landmine, given that it is generally oriented straight up (pushing into the leg from the bottom) has the effect, in some cases, of causing nerve endings to curl up and bend backward in a fraction of a second. Ordinarily flexible, these fibers can snap under such conditions. When this happens, the snapped-off nerve fiber pieces remain living, collocated with intact fibers. When the brain's normal sensory

"ping" is sent out, the feedback from the intact fibers near the site of the amputation is several times more powerful than it should be due to the presence of shredded nerve fibers cluttering the area. The presence of these fragments effectively increase the concentration of conductive chemicals at the site and ultimately leads to the sensation of pain. These conductive chemicals not only conduct electrcity, they reflect it in the way that chaff from a fighter aircraft reflect radar, resulting in a powerful return signal. Unlike a true reflection, this feedback is achieved through a mechanism in which a weak electrical pulse triggers these molecules to release a comparatively large amount of electrical energy. The layering of nerve fibers like rings of a tree trunk make this possible.

If we wish to treat this phantom limb pain, we would need to either find a way to remove the fragments of nerve fibers genreated by the landmine blast or we would need to deaden those nerves. One potentially effective approach to this would be to introduce the chemical signal associated with inflammation after a skin burn to the site repeatedly so that the nerve fiber fragments would eventually be consumed by immune activity; something which should happen with fragments long before damage is done to intact nerve fibers.

Conclusion

By properly understanding how the sense of touch and pain actually works, we stand a much better chance of addressing health problems related to the over or under-sensitivity of nerves.